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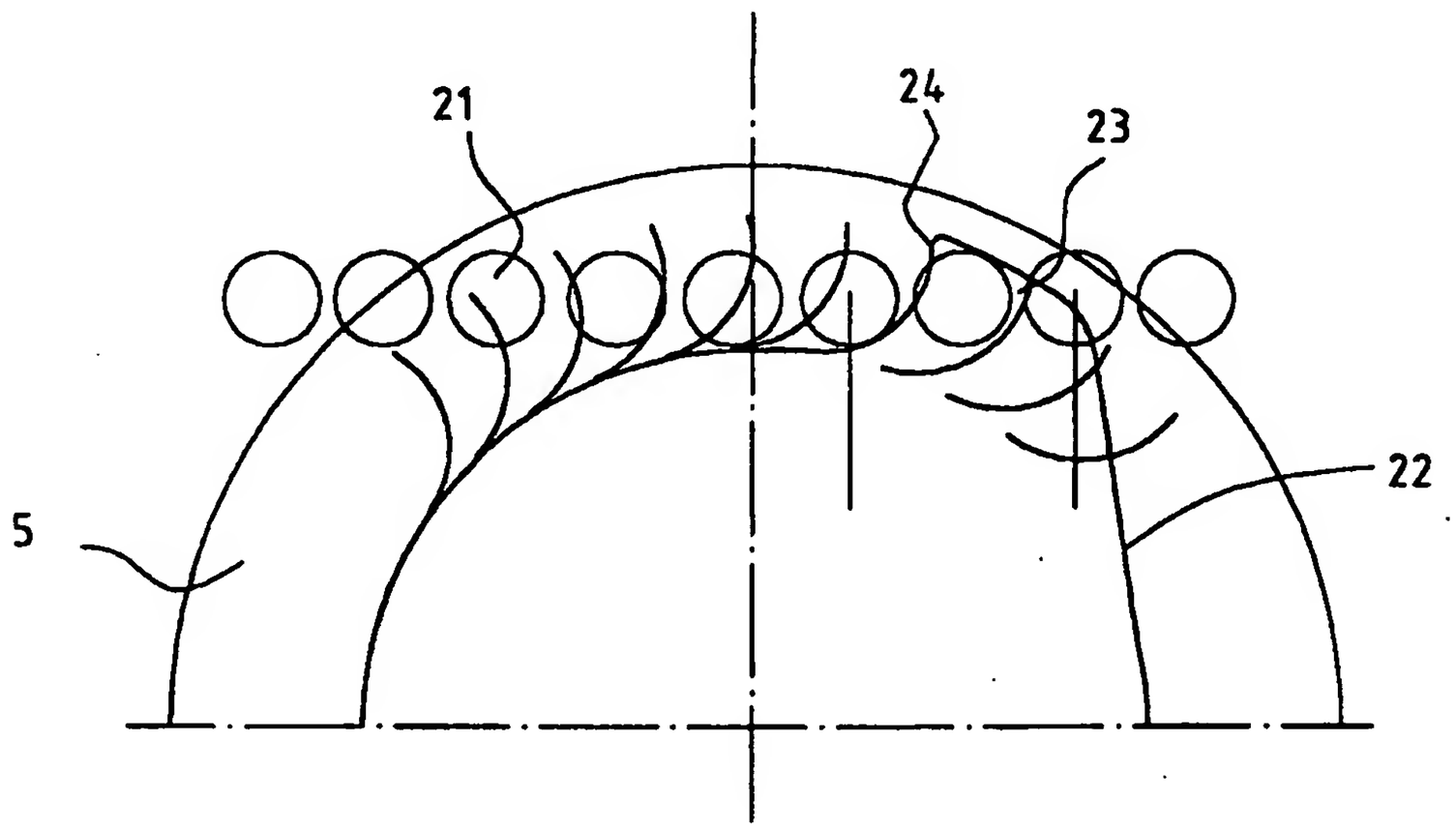

(57) Abstract

According to the invention, in a method for printing an object conveyed by a gripper in a printing device, wherein the object, which is held by the gripper, travels along a substantially linear motion path, in which the gripper is connected to main conveyor means of the rotary printing device, a contact member of the gripper is brought into contact with an alignment member of a component defining a reference position over an engagement interval, in such a manner that the gripper is synchronized with the tangential position and speed of the component defining the reference position at the location of the object to be printed. A method of this kind is advantageously implemented at the location of a printing head and/or at the location of a feed unit. The invention also provides printing devices with features allowing a synchronization of this kind to be carried out.

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METHOD AND DEVICE FOR IN-REGISTER CONVEYING OF SHEETS IN A PRINTING MACHINE

The invention relates to a method for printing an object, which is held by a gripper, in a printing device, wherein the object, which is held by the gripper, travels along a substantially linear motion path through the device, the gripper, for the purpose of gripping, holding and conveying the object, being connected to main conveyor means of the printing device for supplying, conveying and removing the objects to be printed.

Such a method is known from European patent 0 561 474 and is used, for example, for printing sheets of paper in a rotary printing device. In this patent publication, it is described that at least over the section where printing can take place the drive of the gripper is taken over by a second drive, other than the main conveyor means, in order to achieve accurate positioning of the objects to be printed, for example separate sheets of paper. One example mentioned of second drive means of this kind is a threaded spindle, the gripper being provided with a projection which engages in the threaded spindle. Other examples are a toothed belt or an endless drag chain on which a tooth of the gripper engages.

However, the gripper has an inevitable play in the various drive means, in particular in the second drive means. This play is composed of the positioning inaccuracy of the drive means (for example a chain), and the degree of play of the gripper therein. This play, which lies in the order of magnitude of ± 0.4 mm - resulting in a total absolute deviation in the printing results on the substrate of 0.8 mm - is too large to achieve sufficient repetition accuracy. Therefore, it is impossible to use this design concept to produce machines with which a plurality of print runs (different colours and/or different patterns) can be carried out sufficiently accurately on the same substrate.

Another problem which arises with the known printing

device relates to the feed unit, the so-called "Übergabe". This feed unit of the printing device picks up an object to be printed by means of a pick up device and transfers this object to a gripper, the pick up device of the feed unit being positioned against a stop on each gripper. Due to the collision which takes place between the pick up device and the gripper, the feed rate is limited and it is impossible for an object to be printed to be transferred from the pick up device to the gripper accurately and at high speed.

The invention aims to eliminate the abovementioned drawbacks.

The object of the present invention is to provide a method and a device for printing an object, where the object can be positioned accurately both in a printing position and in the feed unit.

More specifically, the object of the present invention is to provide a method and a device with which it is possible to achieve a greater printing repetition accuracy than in accordance with the prior art.

A further object of the invention is to provide a method and a device with which it is possible to achieve a high conveying speed with accurate positioning of objects to be printed.

In particular a further object of the invention is to provide a method and device with which stiff objects can be printed, while the objects are being synchronized at the location, where these objects are printed.

According to the invention, the method of the type described above is characterized in that a contact member of the gripper is allowed to make contact with an alignment member of a component defining a reference position, over an engagement interval, in such a manner that the gripper is synchronized with the tangential position and speed of the component defining the reference position at the location of the object to be printed.

In the method according to the invention, the object to be printed is guided along a substantially linear motion

path, so that stiff objects can also be printed without being folded or otherwise being damaged. For conveyance a gripper is used which is provided with a contact member. In order to achieve accurate and reproducible positioning of the gripper, and therefore of the substrate to be printed, this contact member is brought into contact with an alignment member of a component, which defines the reference position, of the device. The alignment member and the contact member are adjusted to one another in such a manner that the speed of the gripper is made equal to that of the component which comprises the alignment member.

The expression "substantially linear motion path" means herein a path, which is linear or which has a curve radius, which is much greater than the curve radius of the movement of the component which defines the reference position, for example a printing forme and/or a counterpressure-exerting roller of the printing station. In other words, a path, along which the substrate to be printed is not or hardly subjected to bending.

The component defining the reference position may be a printing head, in which case the alignment member may be fixedly connected to this printing head of the printing device. In this case, the gripper is synchronized, at the location of the relevant printing position, with the printing head which moves during the printing.

Another possibility for implementing the method according to the invention is to synchronize the gripper at the location of the entry side of the printing device when feeding the objects to be printed to the gripper by means of a feed unit, in which case the alignment member is fixedly connected to a component defining the reference position at the location of the feed unit, for example a roller or the like. Herein, the picking up of the object to be printed by the gripper takes place in a substantially linear path.

Thus, in the method according to the invention no additional conveyor means are used which temporarily take over the driving of the gripper, but rather the gripper is

synchronized directly, without interference, with either the printing head or the feed unit. The direct result is that the substrate can be supplied and printed much more accurately. A positioning accuracy of ± 0.05 mm can be achieved, resulting in an absolute printing repetition accuracy on the substrate of 0.1 mm. It is thus possible, using the method according to the invention, to print substrates accurately in register in a plurality of successive printing runs, even in the event of repeated passage through and printing in the same printing device in order to print the substrate with different colours and patterns.

Although a multicolor printing device is known from EP-A-0 425 913, wherein the grippers, which hold the substrate to be printed, are fixed by means of fixing devices, which are adjustable in radial and tangential directions which devices are fastened on a sprocket of the counterpressure-exerting roller. In the device the substrate to be printed moves along an undulatory trajectory around the counterpressure-exerting rollers of the printing stations, so that this device is not suitable in order to print stiff objects. The fixing devices described in EP-A-0 425 913 comprise three components which are associated. In the first place a prism having convex sides, wherein a support roller of the roller is fixed. Furthermore a so-called "Traglasche" of the gripper is supported by an alignment face of the sprocket. This fixed position of the gripper with respect to the counterpressure-exerting roller is maintained by means of an electromagnet, until the substrate has been printed. Such a fixed position of the gripper and thus the substrate to be printed is not suitable for printing stiff substrates, because such substrates can not move along the curved trajectory around the counterpressure-exerting roller.

A second aspect of the invention relates to a printing device according to claim 4. In this case, the reference position is given by the printing head. During operation of

the device, the contact member of the gripper is synchronized with the alignment member just before and during the initial passage of the substrate to be printed in the printing head. During the engagement interval, the force from the main conveyor means acting on the substrate via the gripper is made subordinate to that from the printing head (to be divided more specifically below into that from the counterpressure-exerting member and the printing forme), so that accurate and reproducible positioning with respect to the printing head is ensured. It is then possible for the object to be conveyed through the printing head in a reproducible manner, if the frictional force exerted on the substrate by the printing head is greater than all the other forces which could alter the speed and position of the substrate. If necessary, the surface of the counterpressure-exerting member (for example a counterpressure-exerting roller) may be treated so as to increase its coefficient of friction.

Preferably, the counterpressure-exerting member comprises a counterpressure-exerting roller, and the alignment member is connected to the counterpressure-exerting roller. In this embodiment, the design of the printing forme is not interfered with by that of the alignment member.

The alignment member is advantageously a tooth with a curved surface, along which the contact member of the gripper moves during the engagement interval. Teeth of this kind may, for example, be mounted on both sides on the drive shaft of the counterpressure-exerting roller, and may act on contact members positioned on both sides of the substrate, during the engagement interval. If necessary, for example in order to correct a printing forme which has been positioned at a slant or to a print substrate which has already been printed at a slant, the teeth may be set at an angle with respect to one another and then attached to the shaft.

In such an embodiment of the alignment member, the contact member is preferably a roller which is rotatably

mounted in the gripper and rolls along the curved surface of the tooth during the engagement interval.

According to another embodiment, the contact member is a rack which is attached to the gripper and engages in an alignment member designed as a toothed ring during the engagement interval.

Advantageously, the conveyor means comprise at least one circulating main conveyor chain, in which the gripper is mounted with a degree of play. Usually, chains of this kind, to which the grippers are attached, will be present on both sides of a path for the substrate to be printed. The grippers may be designed as a gripper bar which spans the width of the substrate path. In order to allow the gripper bar and a printing head to pass, the counterpressure-exerting roller is advantageously provided with a recess, as has already been described in EP-A-0 561 474. Owing to the play of a gripper in a main conveyor chain, the synchronization cannot be adversely affected by the inaccuracy of the chain itself, so that it is ensured that the printing head controls the conveyance of the substrate during the printing operation. Advantageously, this play is achieved by mounting the gripper in the main conveyor chain under pre-tension, in the same direction as the direction of transport, with the aid of a pre-tensioning spring, so that the gripper adopts a defined at-rest position within the play in the chain.

According to a further preferred embodiment, pre-positioning means are provided for pre-positioning the component defining a reference position with respect to an arriving gripper, so that the gripper is situated within the play of the conveyor chain during the entire engagement interval. A feature of this nature is provided in order to compensate for effects of temperature and wear to the main conveyor chain. Preferably, this is a slow adjustment which will not react to random errors. In this way, the counterpressure-exerting rollers of the printing heads following the first printing head in a multicolour printing

device can be pre-positioned with respect to the chain including gripper by shifting the phase angle of the position of a counterpressure-exerting roller to a defined position, with respect to the counterpressure-exerting roller at the preceding position.

A preferred embodiment of pre-positioning means of this kind comprises a (belt) drive of a counterpressure-exerting roller by the preceding roller, which drive furthermore comprises a pre-tensioning roller and an adjustable roller, as well as a sensor for determining the position of any desired passing gripper with respect to a reference point on the first roller. If a discrepancy is repeatedly measured and exceeds a permissible value, i.e. it is not a question of a random error, but rather of a deviation caused by expansion or contraction of the chain as a result of the effects of temperature or wear, the position of the adjustable roll is reset.

A third aspect of the invention relates to an assembly of a feed unit for feeding objects to be printed and a rotary printing device, according to claim 14. According to the invention, the alignment member is attached to a suitable component at the location of the feed unit, against which alignment member the contact member of a gripper of the main conveyor mechanism of the rotary printing device bears just before and during the transfer of an object to be printed from the feed unit to the gripper. The principle employed here is comparable to the synchronization, which has been described in detail above, of the gripper in a printing head, so that a more detailed explanation is not required here. Advantageously, the gripper will be synchronized both at the feed unit and at the printing head.

Normally, the drive for the feed unit is coupled to the main drive of the printing device. However, in certain situations it may be desirable to uncouple these drives, so that the printing device can be emptied while printing if a fault has occurred. It is also possible in a simple manner to carry out test prints on a few sheets while placing the

device in register.

As a result of the accurate synchronization control according to the invention, it is now possible to allow the transfer of a substrate from the feed unit to a gripper to take place in a "flying" manner, i.e. to transfer the substrate at a constant speed of pick up device and gripper without there being a collision between pick up device and gripper within a short period of time (the engagement interval).

The invention will be explained in more detail below with reference to the attached drawing, in which:

Fig. 1 shows a diagrammatic depiction of part of an embodiment of an assembly of a feed unit and printing device according to the invention;

Fig. 2 is a diagrammatic depiction of the progress of synchronizing an embodiment of a contact member of a gripper and an alignment member of a counterpressure-exerting roller; and

Fig. 3 is a diagrammatic depiction of the progress of synchronising an embodiment of a contact member of a gripper and an alignment member of a feed unit.

Fig. 1 shows an embodiment of an assembly of a rotary printing device 1 and a feed unit 2. The rotary printing device comprises a number of printing heads 3, only two of which are shown in Fig. 1. A device of this kind is suitable for printing a plurality of colours in succession, in one print run, on a substrate (not shown). Each printing head 3 comprises a printing cylinder 4 and a counterpressure-exerting roller 5. In the situation illustrated, there is an intermediate drier 6 between two printing heads 3. The substrate to be printed is picked up from a stack by a pick up device (not shown) of the feed unit 2 and is transferred to a passing gripper 7, after the gripper has been synchronized with respect to the feed unit, as will be illustrated below with reference to Fig. 3. A number of grippers 7 are attached to a circulating main conveyor chain (diagrammatically indicated by reference numeral 8) at

regular distances from one another and with a certain play. The grippers 7 run with rollers in a guide 15. The gripper 7 holding the substrate to be printed is guided by the chain 8 to the first printing head 3, where the gripper is again synchronized with respect to the counterpressure-exerting roller 5, as is illustrated in Fig. 2. The counterpressure-exerting roller 5 of the first printing head 3 is driven in a known manner by main drive 9. This counterpressure-exerting roller 5 mechanically controls the drive 10 of the main conveyor chain 8, by means of a belt drive 11, and is also coupled to the drive of the feed unit 2. In addition, this counterpressure-exerting roller 5 of the first printing head 3 drives the counterpressure-exerting roller 5' of the second printing head 3', via a belt drive 12 which runs over a pre-tensioning roller 13 and an adjustable roller 14. In order to roughly synchronize the position of the counterpressure-exerting roller 5' in advance with an arriving gripper 7', the position thereof with respect to the counterpressure-exerting roller 5 is determined with the aid of a sensor 16. If a repeated deviation from a permissible value is observed, for example as a result of contraction or expansion of the chain owing to wear or the effects of temperature, the phase angle of the position of the counterpressure-exerting roller 5' is adjusted by altering the position of the adjustable roller 14. This ensures that a gripper 7 can always be synchronized within the play of the main conveyor chain with respect to counterpressure-exerting roller 5'. In a comparable manner, the drive 10 is pre-positioned with respect to an arriving gripper 7''.

A printing head 3 will have a structure which is usual for this type of printing device, as described, for example, in EP-A-0 561 474. The circulation of the grippers of the main conveyor chain 8 in the rotary printing device 1 takes place in guides 15, for example comprising a profile in which rollers attached to the gripper are held, so that movement in the plane in which the objects are printed,

other than in the direction of transport, is substantially prevented.

In the figures to be discussed below, identical components to those in Fig. 1 are denoted by the same reference numerals.

Fig. 2 shows a diagrammatic sketch of the engagement interval of a contact member of a gripper with an alignment member of a counterpressure-exerting roller. A gripper comprises a roller 21 which can rotate about a horizontal axis in the gripper (for the sake of clarity only this roller of the gripper is shown). Furthermore, a disc 22 with tooth 23 is fixed to the shaft of a counterpressure-exerting roller 5. The position of the disc 22 on the shaft of the counterpressure-exerting roller can be finely adjusted. The tooth 23 has a curved surface 24, as can be seen from this figure, which acts as a reference surface for the roller 21 over the course of the engagement interval. Thus, just before and during the period in which an object to be printed is supplied, the roller 21 of the gripper in which the object is held comes into contact with the surface 24 and rolls along it over the course of the engagement interval. The curved surface 24 has such a shape, that the gripper is positioned accurately with respect to the counterpressure-exerting roller during the engagement interval, and thus is synchronized with the printing speed of the printing head. During the engagement interval the gripper in question and the substrate, which is hold therein, move along a substantially linear motion path. The substrate moves along a partial trajectory of an almost flat and linear printing path through the printing device. During the actual printing, the counterpressure-exerting roller itself ensures that the object (for example a sheet of paper, cardboard or a stiff substrate like beer mats) is passed through without it being possible for the main conveyor chain to alter the position of the object. After the gripper roller 21 comes off the tooth 23 (following the engagement interval), the pre-tensioning spring force pulls

C O N C L U S I E S

1. Werkwijze voor het bedrukken van een door een grijper vastgehouden voorwerp in een drukinrichting, waarin het door de grijper vastgehouden voorwerp een in hoofdzaak rechtlijnig bewegingstraject door de inrichting aflegt, welke grijper voor het vastgrijpen en vasthouden en transporteren van het voorwerp verbonden is met hoofdtransportmiddelen van de drukinrichting voor het aanvoeren, transporteren en afvoeren van te bedrukken voorwerpen, **met het kenmerk** dat men een contactorgaan (21; 34) van de grijper (7) over een aangrijpingsinterval contact laat maken met een uitrichtorgaan (23; 32) van een een referentiepositie bepalend onderdeel (5; 10), zodanig dat de grijper (7) wordt gesynchroniseerd met de tangentiële positie en snelheid van het de referentiepositie bepalend onderdeel (5; 10) op de plaats van het te bedrukken voorwerp.

2. Werkwijze volgens conclusie 1, **met het kenmerk** dat het uitrichtorgaan (23) vast is verbonden met een drukkop (3) van de drukinrichting (1).

3. Werkwijze volgens conclusie 1, **met het kenmerk** dat het uitrichtorgaan (32) vast is verbonden met een de referentiepositie bepalend onderdeel (10) ter plaatse van een invoereenheid (2) voor het aanbieden van te bedrukken voorwerpen aan de grijper (7).

4. Drukinrichting voor het bedrukken van voorwerpen, welke inrichting transportmiddelen voor het aanvoeren, het transporteren en het afvoeren van te bedrukken voorwerpen langs een in hoofdzaak rechtlijnig bewegingstraject omvat, alsmede een drukkop, omvattende een drukvorm en een tegendrukorgaan, waarbij de transportmiddelen een grijper omvatten voor het vastgrijpen en vasthouden en transporteren van een te bedrukken voorwerp, waarbij de transportmiddelen geschikt zijn voor het door de drukkop transporteren van de grijper, **met het kenmerk** dat de grijper (7) is voorzien van een daarop gepositioneerd contactorgaan (21) en de drukkop (3) is voorzien van een daarop gepositioneerd uitrichtorgaan (23), waarbij het contactorgaan (21) en het uitrichtorgaan (23) geschikt zijn om over een aangrijpingsinterval zodanig op elkaar

pin has a play of a few millimetres in the gripper and with the aid of adjustable springs is pressed towards one side of the play, so that a gripper is always in a defined at-rest position within the play at the start of an engagement interval of the synchronization.

The above example has been explained with reference to a rotary printing device (in particular a rotary screen printing device), i.e. a printing device with a rotating, cylindrical (screen) printing forme. However, the invention can also be used for other types of printing devices, such as flat-bed screen printing devices with a reciprocating printing stencil formed as a patterned, flat screen.

Furthermore, according to the invention various sorts of objects can be printed, for example flat objects, such as substrates made of paper or cardboard and beer mats and also non-flat objects such as packages. Obviously, the grippers must be adapted so as to pick up the objects in question. However, the synchronization of the grippers according to the invention is independent of the type of object to be printed.

CLAIMS

1. Method for printing an object, which is held by a gripper, in a printing device, wherein the object, which is held by the gripper, travels along a substantially linear motion path through the device, the gripper, for the purpose of gripping, holding and conveying the object, being connected to main conveyor means of the printing device for supplying, conveying and removing the objects to be printed, characterized in that a contact member (21; 34) of the gripper (7) is allowed to make contact with an alignment member (23; 32) of a component (5; 10) defining a reference position, over an engagement interval, in such a manner that the gripper (7) is synchronized with the tangential position and speed of the component (5; 10) defining the reference position at the location of the object to be printed.

2. Method according to claim 1, characterized in that the alignment member (23) is fixedly connected to a printing head (3) of the printing device (1).

3. Method according to claim 1, characterized in that the alignment member (32) is fixedly connected to a component (10) defining the reference position at the location of a feed unit (2) for feeding objects to be printed to the gripper (7).

4. Printing device for printing objects, which device comprises conveyor means for supplying, conveying and removing objects to be printed along a substantially linear motion path, as well as a printing head, comprising a printing forme and a counterpressure-exerting member, the conveyor means comprising a gripper for gripping and holding and conveying an object to be printed, the conveyor means being suitable for conveying the gripper through the printing head, characterized in that the gripper (7) is provided with a contact member (21) positioned thereon, and the printing head (3) is provided with an alignment member (23) positioned thereon, the contact member (21) and the alignment member (23) being able to engage on one another

over the course of an engagement interval in such a manner that the gripper (7) is aligned on the printing head (3), so that the gripper (7) is synchronized with the tangential position and speed of the printing head (3) at the location of the object to be printed just before and during the feed of an object to be printed to the printing head (3).

5. Printing device according to claim 4, characterized in that the counterpressure-exerting member comprises a counterpressure-exerting roller (5), and the alignment member (23) is fixedly connected to the counterpressure-exerting roller (5).

6. Printing device according to claim 4 or 5, characterized in that the alignment member is a tooth (23) with a curved surface (24), along which the contact member (21) of the gripper (7) moves during the engagement interval.

7. Printing device according to claim 6, characterized in that the contact member is a roller (21) which is rotatably mounted in the gripper and rolls along the curved surface (24) during the engagement interval.

8. Printing device according to claim 4 or 5, characterized in that the alignment member is a toothed ring.

9. Printing device according to claim 8, characterized in that the contact member is a rack which is attached to the gripper and engages in the toothed ring during the engagement interval.

10. Printing device according to one of the preceding claims 4-9, characterized in that the conveyor means comprise at least one circulating main conveyor chain (8), in which the gripper (7) is mounted with a degree of play.

11. Printing device according to claim 10, characterized in that the gripper (7) is mounted under pre-tension with the aid of a spring in the conveyor chain (8).

12. Printing device according to one of the preceding claims 4-11, characterized in that pre-positioning means are provided for positioning a component defining the reference

position.

13. Printing device according to claim 12, characterized in that the pre-positioning means comprise a sensor (16) for determining the position of a gripper (7'), as well as a pre-tensioning roller (13) and adjustable roller (14) for altering the phase angle of the position of the component defining the reference position.

14. Assembly of a feed unit for feeding objects to be printed and a printing device, which printing device comprises conveyor means for supplying, conveying and removing objects to be printed along a substantially linear motion path and a printing head, the conveyor means of which printing device comprise a gripper for gripping, holding and conveying an object to be printed, characterized in that the gripper (7) is provided with a contact member (34) positioned thereon, and a component (10) defining a reference position at the location of the feed unit (2) is provided with an alignment member (32) positioned thereon, the contact member (34) and the alignment member (32) being able to engage on one another over the course of an engagement interval, in such a manner that the gripper (7) is aligned on the feed unit (2), so that the gripper (7) is synchronized just before and during the period when the feed unit (2) is feeding an object to be printed to the gripper (7).

15. Assembly according to claim 14, characterized in that the alignment member is a tooth (32) with a curved surface (33), along which the contact member (34) of the gripper (7) moves over the course of the engagement interval.

16. Assembly according to claim 15, characterized in that the contact member is a roller (34), which is rotatably mounted in the gripper (7), which roller (34) rolls along the curved surface (33) over the course of the engagement interval.

17. Assembly according to claim 14, characterized in that the alignment member is a toothed ring.

18. Assembly according to claim 17, characterized in that the contact member is a rack which is attached to the gripper and engages in the toothed ring during the engagement interval.

19. Assembly according to one of the preceding claims 14-18, characterized in that pre-positioning means are provided for positioning the component defining the reference position.

20. Assembly according to claim 19, characterized in that the pre-positioning means comprise a sensor for determining the position of a gripper (7''), as well as a pre-tensioning roller and adjustable roller for altering the phase angle of the position of the component defining the reference position.

21. Assembly according to one of the preceding claims 14-20, characterized in that the printing device is a printing device according to one of claims 4-13.

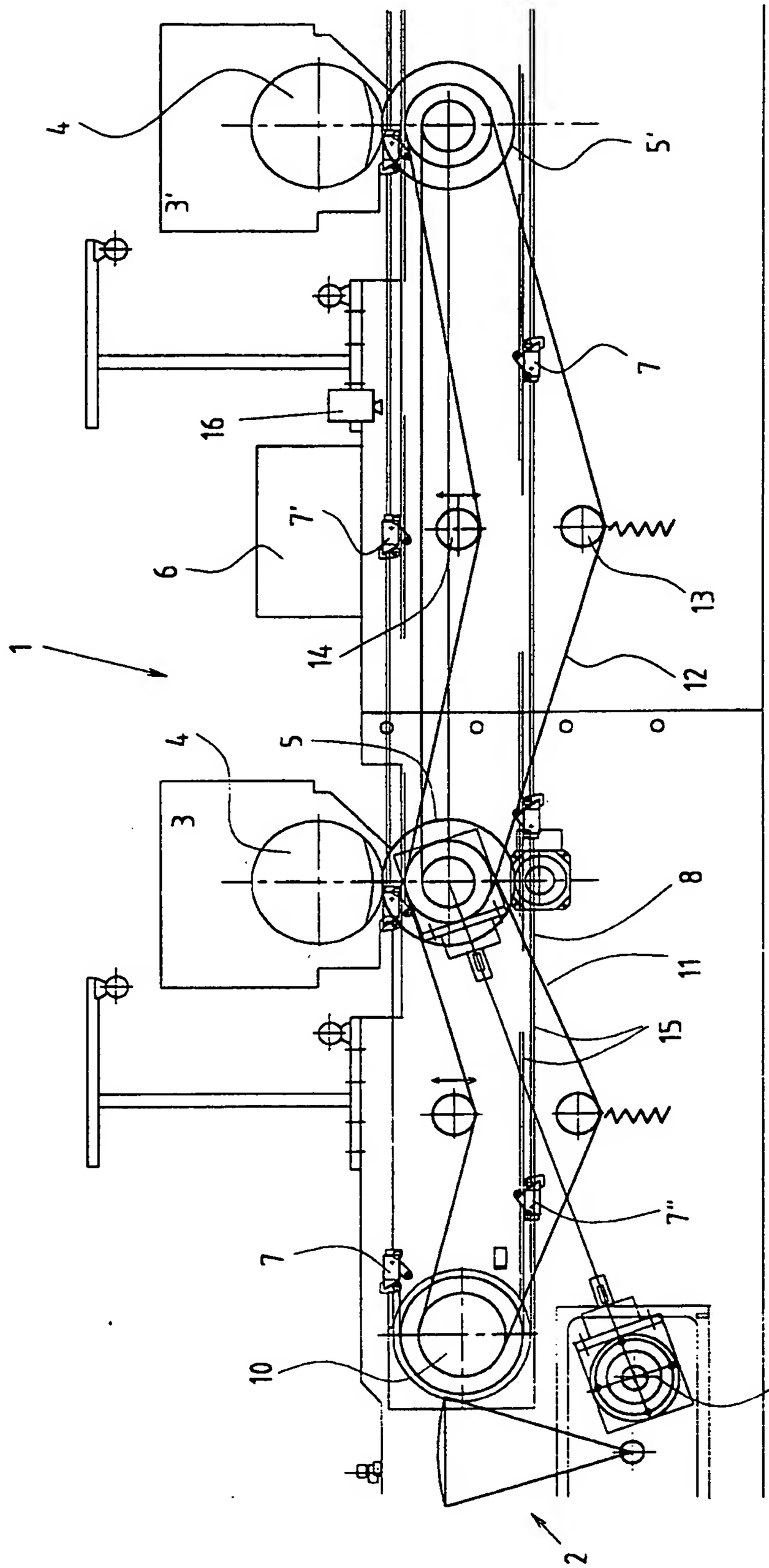

FIG. 1.

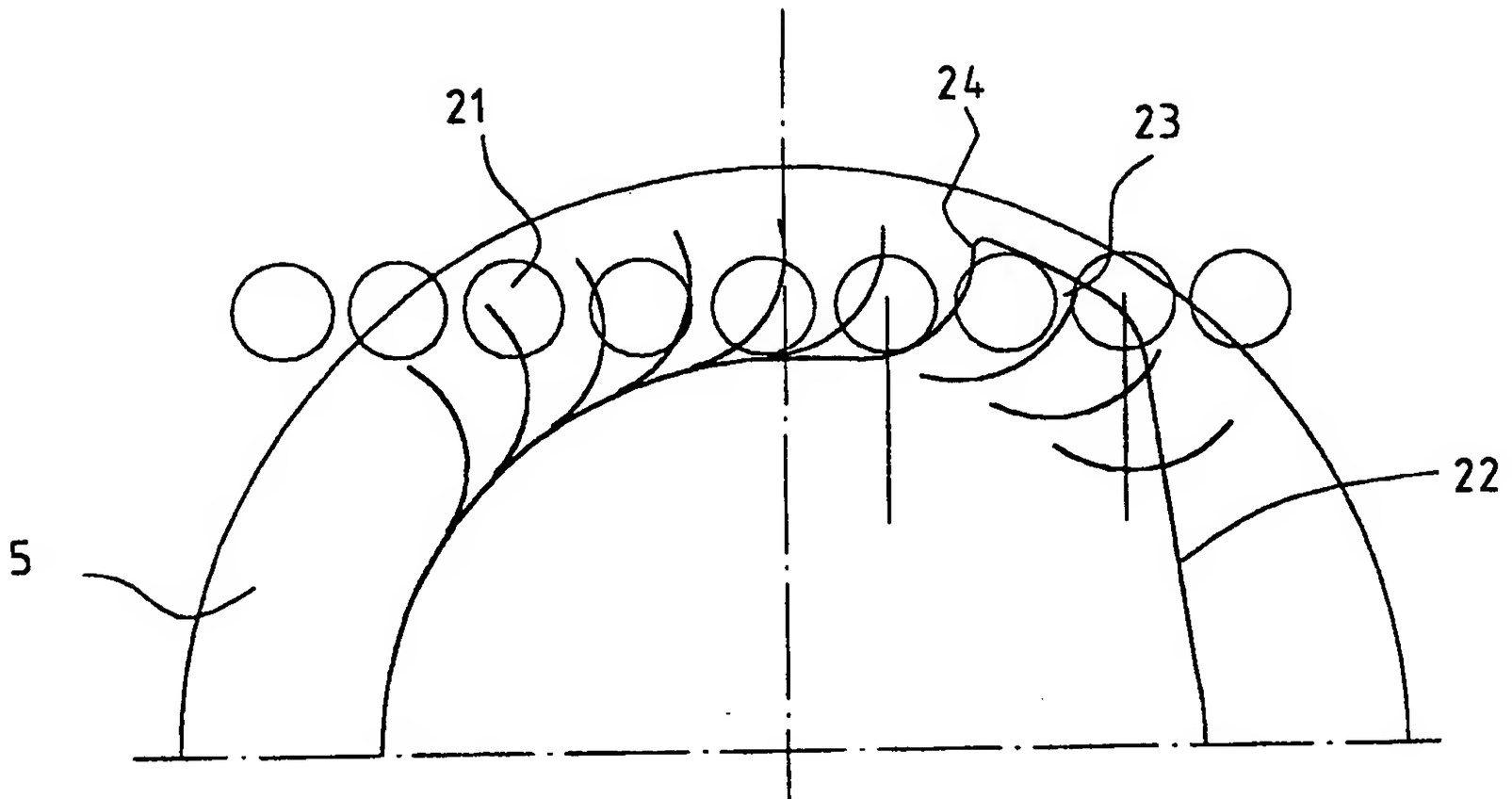

FIG. 2.

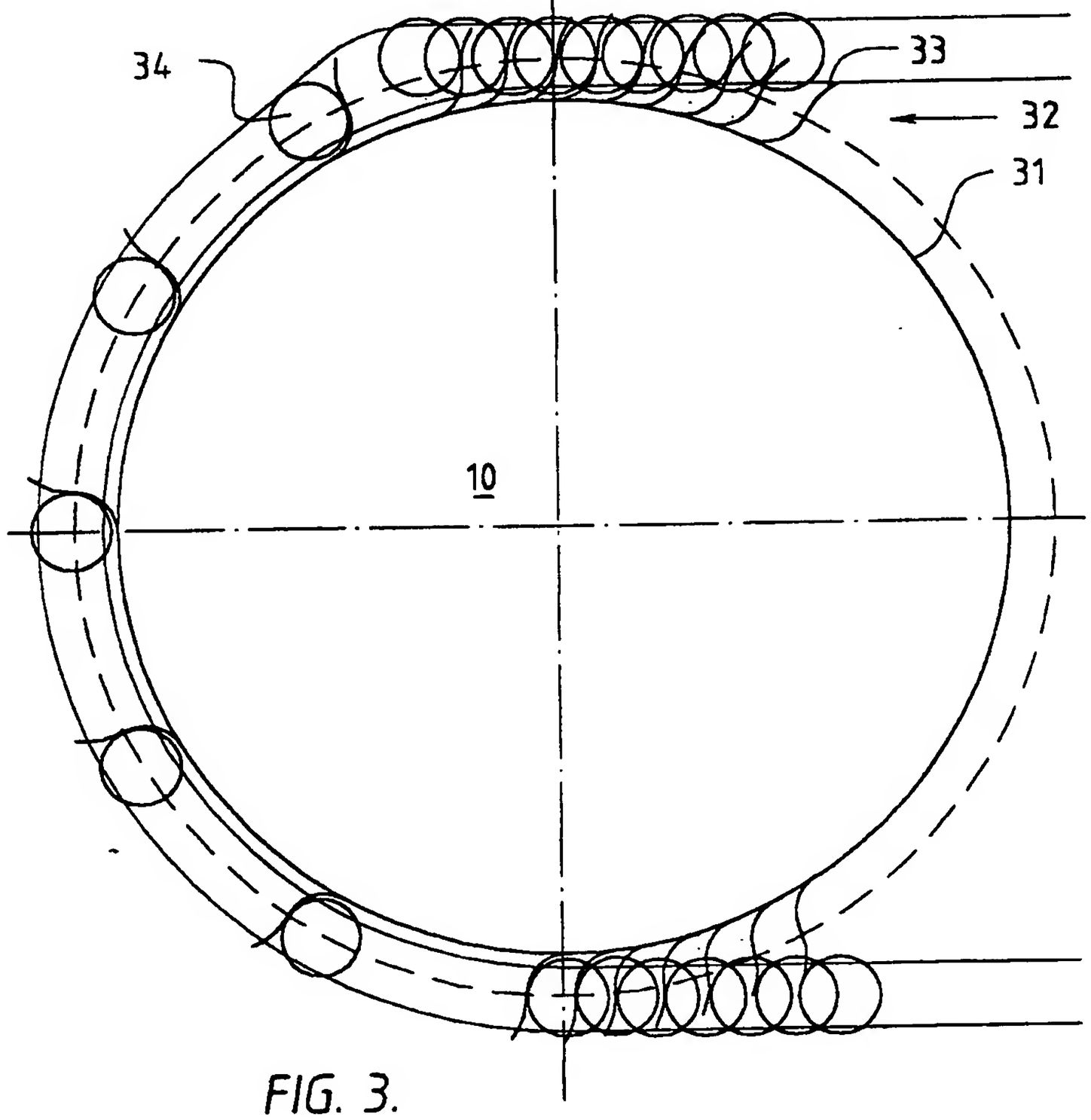

FIG. 3.

INTERNATIONAL SEARCH REPORT

Internatic Application No
PCT/NL 98/00301 —

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B41F21/08 B65H5/08

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B41F B65H

Documentation searched other than minimumdocumentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 425 913 A (M.A.N.-ROLAND DRUCKMASCHINEN AG) 8 May 1991 see abstract; figures see column 4, line 4 - line 33 see column 5, line 48 - line 56 ---	1,2,4-9
X	EP 0 265 803 A (M.A.N.-ROLAND DRUCKMASCHINEN AG) 4 May 1988 see the whole document ---	1,3, 14-18
P,X	GB 2 314 834 A (CRABTREE GATESHEAD LTD) 14 January 1998 see abstract; figures see page 5, line 19 - page 8, line 14 --- -/--	1-5,10, 14

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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"&" document member of the same patent family

Date of the actual completion of theinternational search	Date of mailing of the international search report
25 September 1998	05/10/1998

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category ˜	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 561 474 A (STORK X CEL BV) 22 September 1993 cited in the application see abstract; figures	1,4,14
A	DE 12 24 753 B (KOENIG & BAUER AG) 15 September 1966 see claim; figures see column 4, line 7 - line 31	10,11
A	US 4 791 869 A (FURUKAWA) 20 December 1988 see abstract; figures	12,13, 19,20

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